CHAPTER 26

PRICE AND OUTPUT DETERMINATION: PURE COMPETITION

We now have at our disposal the basic tools of analysis needed to understand how product price and output are determined. These analytical tools are applicable to all four basic market models—pure competition, pure monopoly, monopolistic competition, and oligopoly. In this chapter we focus attention upon price and output determination in a purely competitive industry.

CONCEPT AND OCCURRENCE OF PURE COMPETITION

Pure competition, you will recall, presupposes that certain specific conditions are fulfilled.

1. A purely competitive industry is composed of a large number of independent sellers.
2. The firms offer a standardized product. This feature rules out nonprice competition, that is, advertising, sales promotion, and so forth.
3. No individual firm supplies enough of the product to influence its market price noticeably.
4. In a competitive industry no artificial obstacles prevent new firms from entering or old firms from leaving the industry. Firms and the resources they employ are shiftable, or mobile.

The third characteristic is particularly important. The individual competitive firm has nothing to say about determining market price. Because it supplies a negligible portion of total output, the competitive firm cannot significantly influence the market price which the forces of total demand and supply have established. The competitive firm does not have a price policy, that is, the ability to adjust price. Rather the firm can merely *adjust* to the market price, which it must regard as a given datum determined by the market.

Pure competition is rare in practice. This does not mean, however, that an analysis of how competitive markets work is a useless and irrelevant exercise in logic. In the first place, there are a few industries which more closely approximate the competitive model than they do any other market structure. For example, much can be learned about American agriculture by understanding the functioning of competitive markets. Secondly, pure competition provides the simplest context in which to apply the revenue and cost concepts developed in previous chapters. Pure competition is a simple and meaningful starting point for any discussion of price and output determination. Finally, in the concluding section of this chapter we shall discover that the operation of a purely competitive economy provides us with a standard, or norm, against which the efficiency of the real-world economy can be compared and evaluated. Though pure competition is a relatively rare market structure in our economy, it is one of considerable analytical and some practical importance.

Our analysis of pure competition centers upon three major objectives. First, we seek an understanding of how a competitive producer adjusts to market price in the short run. Next, the nature of long-run adjustments in a competitive industry is explored. Finally, we seek to evaluate the efficiency of competitive industries from the standpoint of society as a whole.

PROFIT MAXIMIZATION IN THE SHORT RUN

In the short run the competitive firm has a fixed plant and is attempting to maximize its profits or, as the case may be, minimize its losses by adjusting its output through changes in the amounts of variable resources (materials, labor, and so forth) it employs. The economic profits its seeks are obviously the difference between total revenue and total costs. Indeed, this points out the direction of our analysis. The revenue data of Chapter 24 and the cost data of Chapter 25 must be brought together in order that the profit-maximizing output for the firm can be determined.

There are two complementary approaches to determining the level of output at which a competitive firm will realize maximum profits or minimum losses. The first involves a comparison of total revenue and total costs; the second, a comparison of marginal revenue and marginal cost. Both approaches, incidentally, can be applied not only to a purely competitive firm but also to firms operating in any of the other three basic market structures. To ensure an understanding of output determination under pure competition, we shall invoke both approaches, emphasizing the marginal approach. Furthermore, both hypothetical data and graphic analysis will be employed to bolster our understanding of the two approaches.

Total-receipts–Total-cost Approach

Given the market price of its product, the competitive producer is faced with three related questions: (1) Should I produce? (2) If so, what amount? (3) What profit (or loss) will be realized?

At first glance the answer to question 1 seems obvious: "You should produce if it is profitable to do so." But the situation is a bit more complex than this. In the short run a part of the firm's total costs is variable costs, and the remainder is fixed costs. The latter will have to be paid "out of pocket" even when the firm is closed down. In the short run a firm takes a loss equal to its fixed costs when it is producing zero units of output. This means that, although there may be no level of output at which the firm can realize a profit, the firm might still produce, provided that in so doing it can realize a loss less than the fixed-cost loss it will face in closing down. In other words, the correct answer to the "Should I produce?" question is this: *The firm should produce in the short run if it can realize an economic profit or a loss which is less than its fixed costs.*

Assuming the firm *will* produce, the second question becomes relevant: "How much should be produced?" The answer here is fairly obvious: *In the short run the firm should produce that output at which it maximizes profits or minimizes losses.*

Now let us examine three cases which will demonstrate the validity of these two generalizations and answer our third query by indicating how profits and losses can be readily calculated. In the first case the firm will maximize its profits by producing. In the second case it will minimize its losses by producing. In the third case the firm will minimize its losses by closing down. Our plan of attack is to assume given short-run cost data for all three cases and to explore the firm's production decisions when faced with three different product prices.

Profit-maximizing case. In all three cases we employ cost data with which we are already familiar. Columns 3 through 5 of Table 26–1 merely repeat the fixed-, variable-, and total-cost data which were developed in Table 25–2. Assuming that market price is $131, we can derive total revenue for each level of output by simply multiplying output times price, as we did in Table 23–3. These data are presented in column 2. Then in column 6 the profit or loss which will be encountered

TABLE 26–1. THE PROFIT-MAXIMIZING OUTPUT FOR A PURELY COMPETITIVE FIRM: TOTAL-REVENUE–TOTAL-COST APPROACH (PRICE = $131) (hypothetical data)

(1) Total product	(2) Total revenue	(3) Total fixed cost	(4) Total variable cost	(5) Total cost	(6) Profit (+) or loss (−), = (2) − (5)
0	$ 0	$100	$ 0	$ 100	$−100
1	131	100	90	190	− 59
2	262	100	170	270	− 8
3	393	100	240	340	+ 53
4	524	100	300	400	+124
5	655	100	370	470	+185
6	786	100	450	550	+236
7	917	100	540	640	+277
8	1,048	100	650	750	+298
9	1,179	100	780	880	+299
10	1,310	100	930	1,030	+280

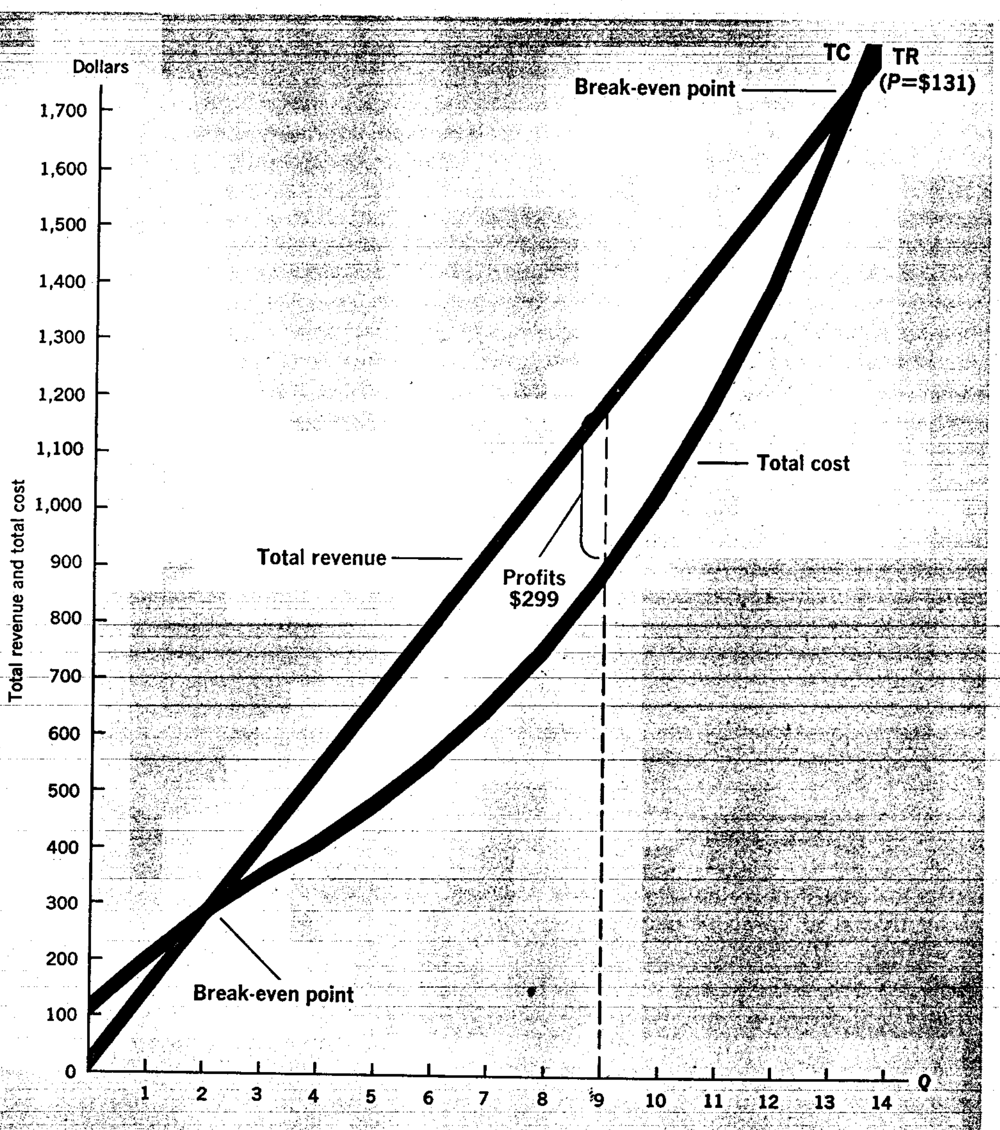
at each output is found by subtracting total cost from total revenue. Now we have all the data needed to answer the three questions.

Should the firm produce? Yes, because it can realize a profit by doing so. How much? Nine units, because column 6 tells us that this is the output at which profits will be at a maximum. The size of that profit? $299.

Figure 26–1*a* compares total revenue and total cost graphically. Total revenue is a straight line, because under pure competition each additional unit adds the same amount—its price—to total revenue (Chapter 23). Total costs increase with output; more production requires more resources. But the rate of increase in total costs varies with the relative efficiency of the firm. For a time the rate of increase in total cost is less and less as the firm utilizes its fixed resources more efficiently. Then, after a time, total cost begins to increase at an ever-increasing rate because of the inefficiencies which accompany overutilization of the firm's plant. A *break-even point* occurs at about 2 units of output. And, if our data were extended beyond 10 units of output, another such point would be incurred where total cost would catch up with total revenue, as is shown in Figure 26–1*a*. Any output within these break-even points will entail an economic profit. The maximum profit is obviously achieved where the vertical difference between total revenue and total cost is greatest. For our data this is at 9 units of output.

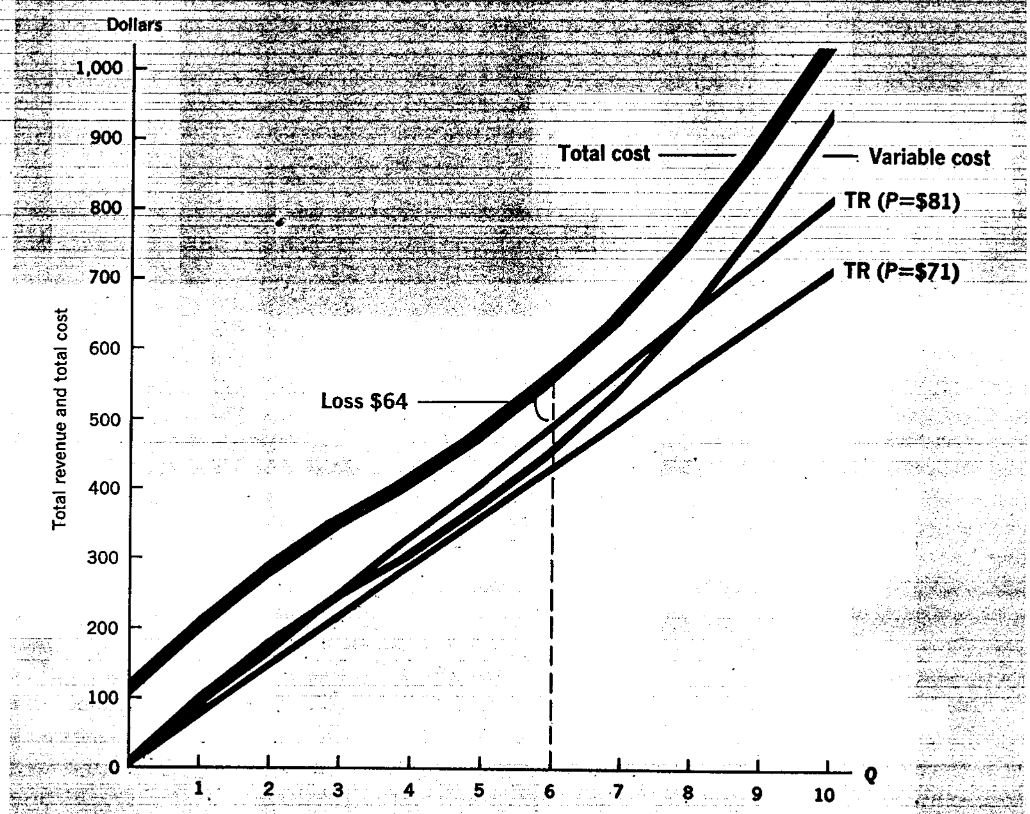
Loss-minimizing case. Assuming no change in costs, the firm may not be able to realize economic profits if the market yields a price considerably below $131. To illustrate: Suppose the market price is $81. As column 6 of Table 26–2 indicates, at this price all levels of output will entail losses. But the firm will not close down. Why? Because by producing the firm can realize a loss very considerably less than the fixed-cost loss it will incur by closing down. Specifically, the firm will minimize its losses by producing 6 units of output. The resulting $64 loss is clearly preferable to the $100 loss which closing down will involve. Stated differently, by producing 6 units the firm earns a total revenue of $486 sufficient to pay all the firm's variable costs ($450) and also a substantial portion—$36 worth—of the firm's fixed costs. There are, you will note, several other outputs which entail a loss less than the firm's $100 fixed

FIGURE 26–1. THE PROFIT-MAXIMIZING, LOSS-MINIMIZING, AND CLOSE-DOWN CASES AS SHOWN BY THE TOTAL-REVENUE–TOTAL-COST APPROACH. A firm's profits are maximized in (*a*) at that output at which total revenue exceeds total cost by the maximum amount. A firm will minimize its losses in (*b, see page 462*) by producing at that output at which total cost exceeds total revenue by the smallest amount. However, if there is no output at which total revenue exceeds variable costs, the firm will minimize losses in the short run by closing down.



(*a*)

FIGURE 26–1 *(continued)*



(b)

costs; but at 6 units of output the loss is minimized.

Close-down case. Assume finally that the market price is a mere \$71. Given short-run costs, column 9 of Table 26–2 clearly indicates that at all levels of output losses will exceed the \$100 fixed-cost loss the firm will incur by closing down. Obviously, then, the firm will minimize its losses by closing down, that is, by producing zero units of output.

Figure 26–1*b* demonstrates the loss-minimizing and close-down cases graphically. In the loss-minimizing case the total-revenue line *TR* ($P = \$81$) exceeds total variable cost by the maximium amount at 6 units of output. Here total revenue is \$486, and the firm recovers all of its \$450 of variable costs and also \$36 worth of its fixed costs. The firm's minimum loss is \$64, clearly superior to the \$100 fixed-cost loss involved in closing down. In the close-down case the total-revenue line *TR* ($P = \$71$) lies below the total-variable-cost curve at all points; there is no output at which variable costs can be recovered. Therefore, by producing, the firm would incur losses in excess of its fixed costs. The firm's best choice therefore is to close down and pay its \$100 fixed-cost loss out of pocket.

TABLE 26–2. THE LOSS-MINIMIZING OUTPUTS FOR A PURELY COMPETITIVE FIRM: TOTAL-REVENUE–TOTAL-COST APPROACH (PRICES = $81 AND $71) (hypothetical data)

	Product Price = $81					Product Price = $71		
(1) Total product	(2) Total revenue	(3) Total fixed cost	(4) Total variable cost	(5) Total cost	(6) Profit (+) or loss (−), = (2) − (5)	(7) Total revenue	(8) Total cost	(9) Profit (+) or loss (−), = (7) − (8)
0	$ 0	$100	$ 0	$ 100	$−100	$ 0	$ 100	$−100
1	81	100	90	190	−109	71	190	−119
2	162	100	170	270	−108	142	270	−128
3	243	100	240	340	− 97	213	340	−127
4	324	100	300	400	− 76	284	400	−116
5	405	100	370	470	− 65	355	470	−115
6	486	100	450	550	− 64	426	550	−124
7	567	100	540	640	− 73	497	640	−143
8	648	100	650	750	−102	568	750	−182
9	729	100	780	880	−151	639	880	−241
10	810	100	930	1,030	−220	710	1,030	−320

Marginal-revenue–Marginal-cost Approach

An alternative means for determining the amounts which a competitive firm will be willing to offer in the market at each possible price is for the firm to determine and compare the amounts that each additional unit of output will add to total revenue, on the one hand, and to total cost, on the other. That is, the firm should compare the *marginal revenue* (MR) and the *marginal cost* (MC) of each successive unit of output. Any unit whose marginal revenue exceeds its marginal cost should obviously be produced. Why? Because on each such unit the firm is gaining more in revenue from its sale than it adds to costs in getting that unit produced. The unit of output is adding to profits or, as the case may be, subtracting from losses. Similarly, if the marginal cost of a unit of output exceeds its marginal revenue, the firm should avoid producing that unit. It will add more to costs than to revenue; such a unit will not "pay its way."

In the initial stages of production, where output is relatively low, marginal revenue will usually (but not always) exceed marginal cost. It is therefore profitable to produce through this range of output. But at later stages of production, where output is relatively high, rising marginal costs will cause the reverse to be true. Marginal cost will exceed marginal revenue. Production of units of output falling in this range is obviously to be avoided in the interest of maximizing profits. Separating these two production ranges will be a unique point at which marginal revenue equals marginal cost. This point is the key to the output-determining rule: *The firm will maximize profits or minimize losses by producing at that point where marginal revenue equals marginal cost.* For convenience we shall call this profit-maximizing guide the MR = MC rule. For most sets of MR and MC data there will be no nonfractional level of output at which MR and MC are precisely equal. In such instances the firm should produce the last complete unit of output whose MR exceeds its MC.

Two features of this MR = MC rule merit

comment. First, a qualification: The rule presumes that the firm will choose to produce rather than close down. Shortly we shall note that marginal revenue must be equal to or exceed average variable cost, or the firm will find it preferable to close down rather than produce the MR = MC output.

Second, it is to be emphasized that the MR = MC rule is an accurate guide to profit maximization for all firms, be they purely competitive, monopolistic, monopolistically competitive, or oligopolistic. The rule's application is not limited to the special case of pure competition. At the same time it is noteworthy that the MR = MC rule can be conveniently restated in a slightly different form when being applied to a purely competitive firm. You will recall that product price is determined by the broad market forces of supply and demand, and although the competitive firm can sell as much or as little as it chooses at that price, the firm cannot manipulate the price itself. In technical terms the demand, or sales, schedule faced by a competitive seller is perfectly elastic at the going market price. The result is that product price and marginal revenue are equal; that is, each extra unit sold adds precisely its price to total revenue (Chapter 23). Thus under pure competition—and *only* under pure competition—we may substitute price for marginal revenue in the rule, so it reads as follows: *To maximize profits or minimize losses the competitive firm should produce at that point where price equals marginal cost* ($P = MC$).

Now let us apply the MR = MC or, if you prefer, MR (P) = MC rule, using the same three prices employed in our total-revenue–total-cost approach to profit maximization.

Profit-maximizing case. Table 26–3 reproduces the unit- and marginal-cost data derived in Table 25–2. It is, of course, the marginal-cost data of column 5 in Table 26–3 which we wish to compare with price (equal to marginal revenue) for each unit of output. Suppose first that market price, and therefore marginal revenue, is \$131 as shown in column 6. What is the profit-maximizing output? It is readily seen that each and every unit of output up to and including the ninth adds more to total revenue than to total cost. That is, price, or marginal revenue, exceeds marginal cost on all of the first 9 units of output. Each of these units therefore adds to the firm's profits and should obviously be produced. The tenth unit, however, will not be produced because it would add more to costs—\$150—than to revenue—\$131.

The level of economic profits realized by the firm can be readily calculated from the unit-cost data. Multiplying price (\$131) times output (9), we find total revenue to be \$1,179. Total cost of about[1] \$880 is found by multiplying average total cost (\$97.78) by output (9). The difference of \$299 is economic profits. An alternative means of calculating economic profits is to determine profit *per unit* by subtracting average total cost (\$97.78) from product price (\$131) and multiplying the difference (per unit profits of \$33.22) by the level of output (9). The skeptical reader should calculate profits at outputs other than those indicated most profitable by the MR (P) = MC rule to verify that they entail either losses or profits less than \$299.

Figure 26–2 makes the comparison of price and marginal cost graphically. Here per unit economic profit is indicated by the distance AP. When multiplied by the profit-maximizing output, the resulting total economic profit is shown by the white rectangular area.

It should be noted that the firm is seeking

[1] In most instances the unit-cost data are rounded figures. Therefore, economic profits calculated from them will typically vary by a few cents from the profits determined in the total-revenue–total-cost approach. We here ignore the few cents differentials and make our answers consistent with the results of the total-revenue–total-cost approach.

TABLE 26–3. THE PROFIT-MAXIMIZING OUTPUTS FOR A PURELY COMPETITIVE FIRM: MARGINAL-REVENUE-EQUALS-MARGINAL-COST APPROACH (PRICE = $131) (hypothetical data)

(1) Total product	(2) Average fixed cost	(3) Average variable cost	(4) Average total cost	(5) Marginal cost	(6) Price = marginal revenue
0					
				$ 90	$131
1	$100.00	$90.00	$190.00		
				80	131
2	50.00	85.00	135.00		
				70	131
3	33.33	80.00	113.33		
				60	131
4	25.00	75.00	100.00		
				70	131
5	20.00	74.00	94.00		
				80	131
6	16.67	75.00	91.67		
				90	131
7	14.29	77.14	91.43		
				110	131
8	12.50	81.23	93.73		
				130	131
9	11.11	86.67	97.78		
				150	131
10	**10.00**	**93.00**	**103.00**		

to maximize its *total* profits, not its *per unit* profits. Per unit profits are largest at 7 units of output, where price exceeds average total cost by $39.57 ($131 minus $91.43). But by producing only 7 units, the firm would be forgoing the production of additional units of output which would clearly contribute to total profits. The firm is happy to accept lower per unit profits if the resulting extra units of sales more than compensate for the lower per unit profits.

Loss-minimizing case. Now let us apply the same reasoning on the assumption that market price is $81 rather than $131. Should the firm produce? If so, how much? And what will the resulting profits or losses be? The answers, respectively, are: "Yes," "Six units," and "A loss of $64."

Column 6 of Table 26–4 shows the new price (equal to marginal revenue) alongside the same unit- and marginal-cost data presented in Table 26–3. Comparing columns 5 and 6, we find that the first unit of output adds $90 to total cost but only $81 to total revenue. One might be inclined to conclude: "Don't produce—close down!" But this would be hasty. Remember that in the very early stages of production marginal physical returns are low, making marginal cost unusually high. The price–marginal-cost relationship might improve with increased production. And it does. On the next five units—2 through 6—price exceeds marginal

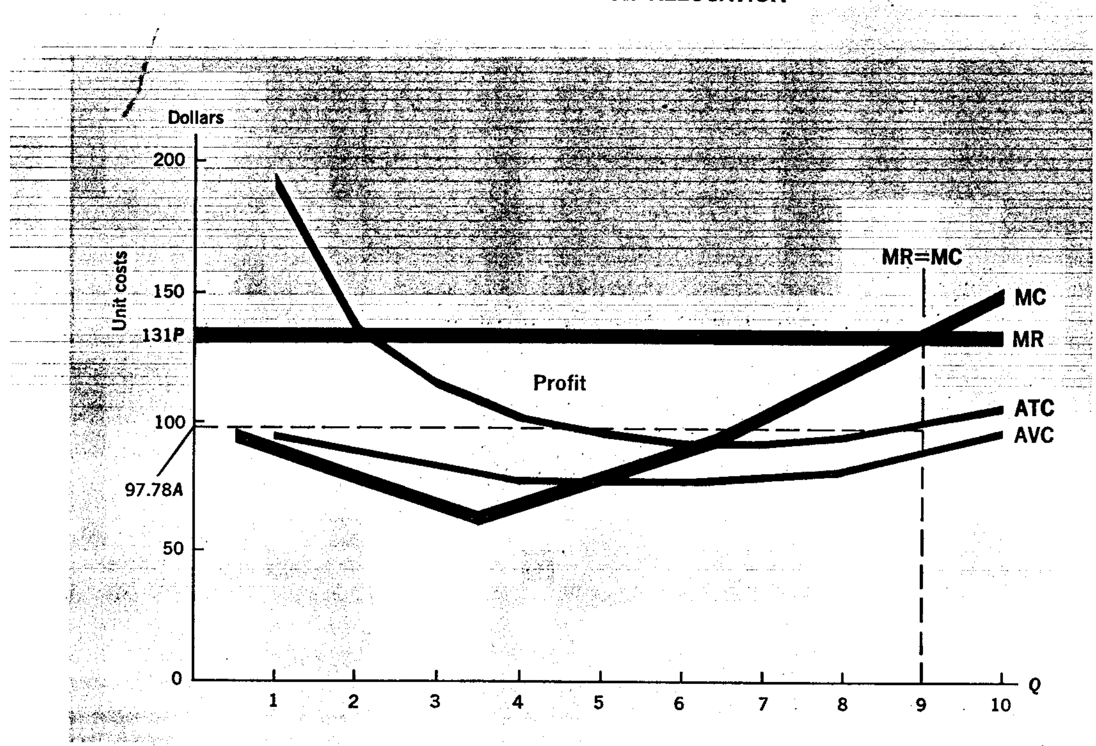


FIGURE 26–2. THE SHORT-RUN PROFIT-MAXIMIZING POSITION OF A PURELY COMPETITIVE FIRM.
The P = MC output allows the competitive producer to maximize profits or minimize losses. In this case price exceeds average total cost at the P = MC output of 9 units. Economic profits per unit of AP are realized; total economic profits are indicated by the white rectangle.

cost. Each of these 5 units adds more to revenue than to cost, more than compensating for the "loss" taken on the first unit. Beyond 6 units, however, MC exceeds MR (P). The firm should therefore produce at 6 units. In general, the profit-seeking producer should always compare marginal revenue (price) with the rising portion of his marginal-cost schedule or curve.

Will production be profitable? No, it will not. At 6 units of output average total costs of $91.67 exceed price of $81 by $10.67 per unit. Multiply by the 6 units of output, and the firm's total loss is about $64. Then why produce? Because this loss is less than the firm's $100 worth of fixed costs—the $100 loss the firm would incur in the short run by closing down. Looked at differently, the firm receives enough revenue per unit ($81) to cover its variable costs of $75 and also provide $6 per unit, or a total of $36, to apply against the payment of fixed costs. Therefore, the firm's loss is only $64 ($100 minus $36), rather than $100.

This case is shown graphically in Figure 26–3. Whenever price exceeds the minimum average variable cost but falls short of average total cost, the firm can pay a part of, but not all, its fixed costs by producing. In this instance total variable costs are shown

TABLE 26-4. THE LOSS-MINIMIZING OUTPUTS FOR A PURELY COMPETITIVE FIRM: MARGINAL-REVENUE-EQUALS-MARGINAL-COST APPROACH (PRICES = $81 AND $71) (hypothetical data)

(1) Total product	(2) Average fixed cost	(3) Average variable cost	(4) Average total cost	(5) Marginal cost	(6) $81 price = marginal revenue	(7) $71 price = marginal revenue
0						
				$ 90	$81	$71
1	$100.00	$90.00	$190.00			
				80	81	71
2	50.00	85.00	135.00			
				70	81	71
3	33.33	80.00	113.33			
				60	81	71
4	25.00	75.00	100.00			
				70	81	71
5	20.00	74.00	94.00			
				80	81	71
6	16.67	75.00	91.67			
				90	81	71
7	14.29	77.14	91.43			
				110	81	71
8	12.50	81.23	93.73			
				130	81	71
9	11.11	86.67	97.78			
				150	81	71
10	10.00	93.00	103.00			

by the area *OVGF*. Total revenue, however, is *OPEF*, greater than total variable costs by *VPEG*. This excess of revenue over variable costs can be applied against total fixed costs, represented by area *VACG*.

Close-down case. Suppose now that the market yields a price of only $71. In this case it will pay the firm to close down, to produce nothing. Why? Because there is no output at which the firm can cover its average variable costs, much less its average total cost. In other words, the smallest loss it can realize by producing is greater than the $100 worth of fixed costs it will lose by closing down. The smart thing is obviously to close down. This can be verified by comparing columns 3 and 7 of Table 26-4 and can be readily visualized in Figure 26-4. Price comes closest to covering average variable costs at the MR (P) = MC output of 5 units. But even here price or revenue per unit would fall short of average variable cost by $3 ($74 minus $71). By producing at the MR (P) = MC output the firm would lose its $100 worth of fixed costs *plus* $15 ($3 on each of the five units) worth of variable costs, for a total loss of $115. This clearly compares unfavorably with the $100 fixed-cost loss the firm would incur by choosing to close down. In short, it will obviously pay the firm to close down rather than operate at a $71 price or, for that matter, at any price less than $74.

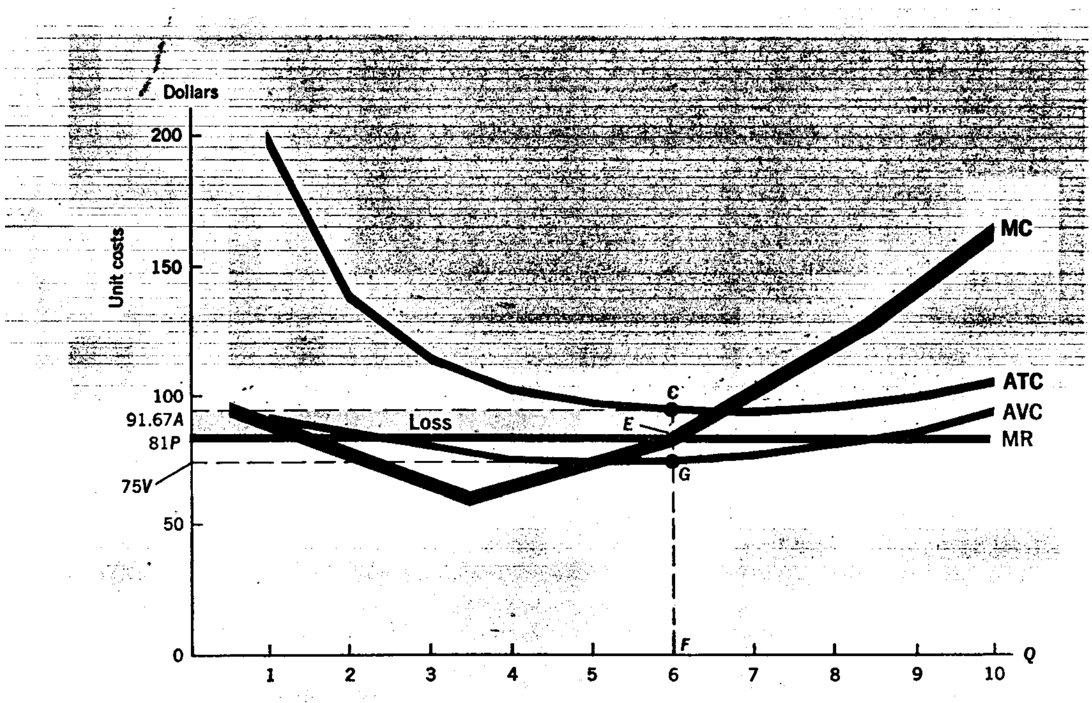


FIGURE 26–3. THE SHORT-RUN LOSS-MINIMIZING POSITION OF A PURELY COMPETITIVE FIRM.

If price exceeds the minimum AVC but is less than ATC, the P = MC output of 6 units will permit the firm to minimize its losses. In this instance losses are AP per unit; total losses are shown by area APEC.

The close-down case obligates us to modify our MR (P) = MC rule for profit maximization or loss minimization. *A competitive firm will maximize profits or minimize losses in the short run by producing at that output at which MR (P) = MC, provided that price exceeds the minimum average-variable-cost figure.*

Marginal cost and the short-run supply curve. Now the astute reader will recognize that we have simply selected three different prices and asked how much the profit-seeking competitive firm, faced with certain costs, would choose to offer or supply in the market at each of these prices. This information—price and corresponding quantity supplied—obviously constitutes the supply schedule for the competitive firm. Table 26–5 summarizes the supply-schedule data for the three prices we have chosen—$131, $81, and $71. The reader is urged to apply the MR (P) = MC rule (as modified by the close-down case) to verify the quantity-supplied data for the $151, $111, $91, and $61 prices and calculate the corresponding profits or losses. The supply schedule is obviously upsloping. In this instance price must be $74 (equal to minimum average variable cost) or greater before any output is supplied. The profit-seeking firm is induced to offer more of the product as higher and higher prices

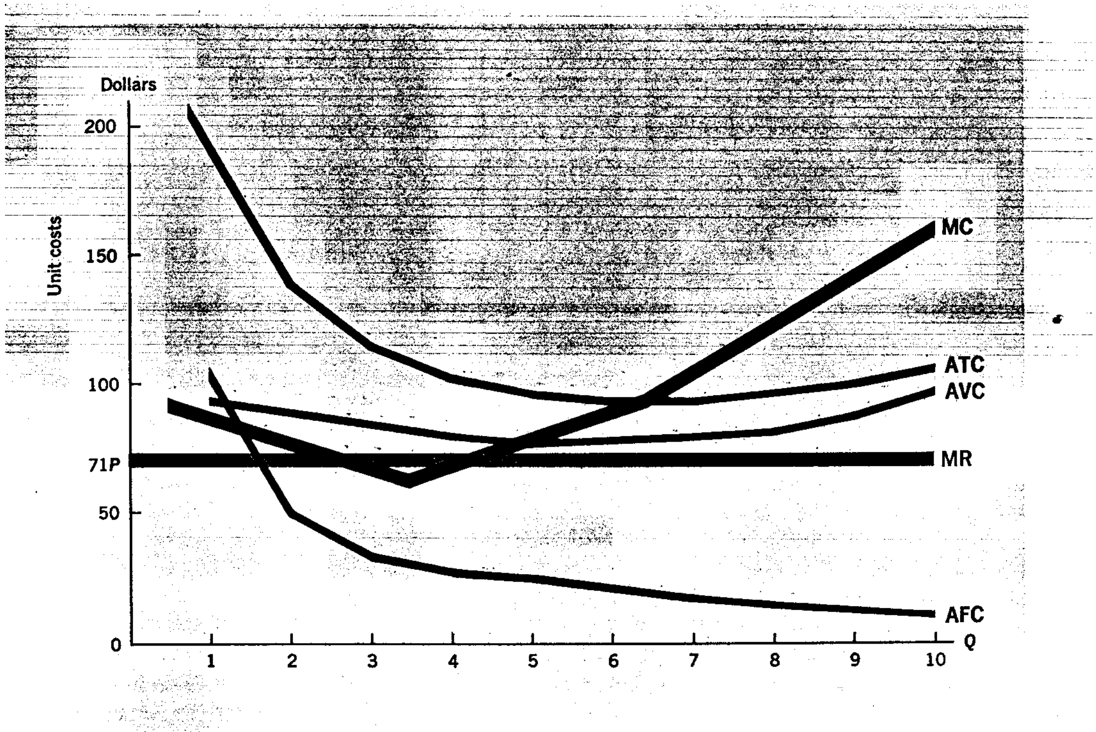


FIGURE 26–4. THE SHORT-RUN CLOSE-DOWN POSITION OF A PURELY COMPETITIVE FIRM.

If price falls short of minimum AVC, the competitive firm will minimize its losses in the short run by closing down. There is no level of output at which the firm can produce and realize a loss smaller than its fixed costs.

TABLE 26–5. THE SUPPLY SCHEDULE OF A COMPETITIVE FIRM CONFRONTED WITH THE COST DATA OF TABLE 26–3 (hypothetical data)

Price	Quantity supplied	Maximum profit (+) or minimum loss (−)
$151	10	$
131	9	+299
111	8	
91	7	
81	6	− 64
71	0	−100
61	0	

are equated with the marginal cost of larger and larger outputs in the cost table.

Figure 26–5 generalizes upon our application of the MR (P) = MC rule. Here we have drawn the appropriate cost curves. Then from the vertical axis we have extended a series of marginal-revenue lines from some of the various possible prices which the market might set for the firm. The crucial prices are P_2 and P_4. Our close-down case reminds us that at any price *below* P_2—that price equal to the minimum average variable cost—the firm should close down and supply nothing. Actually, by producing Q_2 units of output at a price of P_2, the firm will just

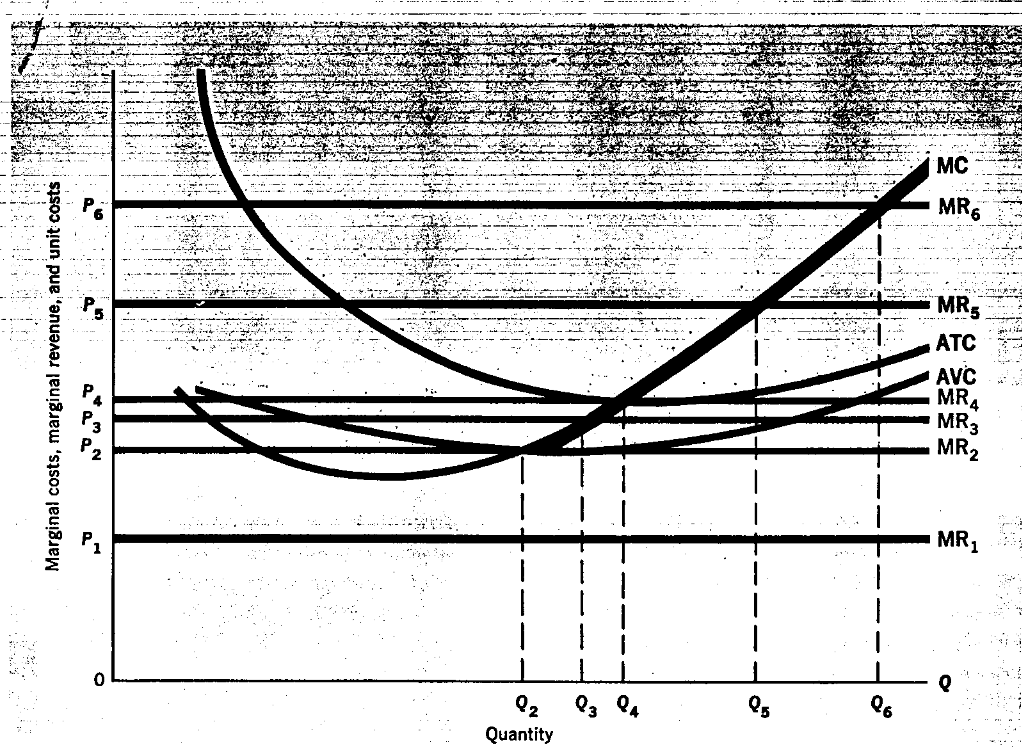


FIGURE 26–5. MARGINAL COST AND THE COMPETITIVE FIRM'S SHORT-RUN SUPPLY CURVE.

Application of the P = MC rule, as modified by the close-down case, reveals that the segment of the firm's MC curve which lies above AVC is its short-run supply curve. At any price between P_2 and P_4, such as P_3, losses will be minimized by producing the P = MC output. At any price above P_4, such as P_5 or P_6, profits will be maximized at the P = MC output.

cover its variable costs, and its losses will be equal to its fixed costs. The firm, therefore, would be indifferent as between closing down and producing Q_2 units of output. But at any price below P_2, such as P_1, the firm will close down and supply zero units of output. P_4 is strategic because it is the price at which the firm will just break even by producing Q_4 units of output, as indicated by the MR (P) = MC rule. Here total revenue will just cover total costs (including a normal profit). At P_3 the firm supplies Q_3 units of output and in so doing minimizes its losses. At any other price between P_2 and P_4 the firm will minimize its losses by producing to the point where MR (P) = MC. At any price above P_4 the firm will maximize its economic profits by producing to the point where MR (P) = MC. Thus at P_5 and P_6 the firm will realize the greatest profits by supplying Q_5 and Q_6 units of output.

Now the basic point is this: Each of the various MR (P) = MC intersection points (shown by the dots in Figure 26–5) indicates a possible product price and the corresponding quantity which the profit-seeking firm would supply at that price. These points, by definition, constitute the supply curve of the competitive firm. Because nothing would be produced at any price below the minimum average variable cost, we can conclude that *that portion of the firm's marginal-cost curve which lies above its average-variable-cost curve is its short-run supply curve.* This is the link between production costs and supply in the short run.

Short-run Competitive Pricing

Let us now pause to summarize the main points we have made concerning short-run competitive pricing. Table 26–6 provides a convenient check sheet on the total-revenue–total-cost and MR = MC approaches to determining the competitive firm's profit-maximizing output. This table warrants careful study by the reader. In the MR = MC approach it is noteworthy that in deciding whether or not to produce, it is the comparison of price with minimum average variable cost which is all-important. Then, in determining the profit-maximizing or loss-minimizing amount to produce, it is the comparison or, better yet, the equality of MR (P) and MC which is crucial. Finally, in determining the actual profit or loss associated with the MR (P) = MC output, price and average total cost must be contrasted. A final basic conclusion implied in Table 26–6 is that that segment of the short-run marginal-cost curve which lies above the average variable cost curve is the competitive firm's short-run supply curve. This conclusion stems from the application of the MR (P) = MC rule and the necessary modification suggested by the close-down case.

Firm and Industry: Equilibrium Price

Now one final wrap-up step remains. Having developed the competitive firm's short-run supply curve through the application of the MR (P) = MC rule, we must determine which of the various price possibilities will actually be the equilibrium price. Recalling Chapter 4, we know that in a purely competitive market equilibrium price is determined by *total,* or market, supply and total demand. To derive total supply we know that the sales schedules or curves of the individual competitive sellers must be

TABLE 26–6. SUMMARY OF THE TOTAL-REVENUE–TOTAL-COST AND MARGINAL-REVENUE–MARGINAL-COST APPROACHES TO COMPETITIVE OUTPUT DETERMINATION IN THE SHORT RUN

	Total-revenue–total-cost approach	Marginal-revenue–marginal-cost approach
Should the firm produce?	Yes, if TR exceeds TC or if TC exceeds TR by some amount less than total fixed costs.	Yes, if price is equal to, or greater than, minimum average variable cost.
What quantity should be produced to maximize profits?	Produce where the excess of TR over TC is a maximum or where excess of TC over TR* is a minimum (and less than total fixed costs).	Produce where MR or price equals MC.
Will production result in an economic profit?	Yes, if TR exceeds TC. No, if TC exceeds TR.	Yes, if price exceeds average total cost. No, if average total cost exceeds price.

TABLE 26–7. FIRM AND MARKET SUPPLY AND MARKET DEMAND (hypothetical data)

(1) Quantity supplied, single firm	(2) Total quantity supplied, 1,000 firms	(3) Product price	(4) Total quantity demanded
10	10,000	$151	4,000
9	9,000	131	6,000
8	8,000	111	8,000
7	7,000	91	9,000
6	6,000	81	11,000
0	0	71	13,000
0	0	61	16,000

summed. Thus in Table 26–7, columns 1 and 3 repeat the individual competitive firm's supply schedule just derived in Table 26–5. Let us now conveniently assume that there are a total of 1,000 competitive firms in this industry, each having the same total and unit costs as the single firm we have been discussing. This allows us to calculate the total or market supply schedule (columns 2 and 3) by multiplying the quantity-supplied figures of the single firm (column 1) by 1,000.

Now in order to determine equilibrium price and output, this total supply data must be compared with total demand data. For purposes of illustration, let us assume total demand data are as shown in columns 3 and 4 of Table 26–7. Comparing the total quantity supplied and total quantity demanded at the seven possible prices, we readily determine that the equilibrium price is $111 and that equilibrium quantity is 8,000 units for the industry and 8 units for each of the 1,000 identical firms.

Will these conditions of market supply and demand make this a prosperous or unprosperous industry? Multiplying product price ($111) by output (8), we find the total revenue of each firm to be $888. Total cost is $750, found by multiplying average total cost of $93.73 by 8 or simply by looking at column 5 of Table 26–1. The $138 difference is the economic profit of each firm. Another way of calculating economic profits is to determine *per unit* profit by subtracting average total cost ($93.73) from product price ($111) and multiplying the difference (per unit profits of $17.27) by the firm's equilibrium level of output (8). For the industry, total economic profit is obviously $138,000. This, then, is a prosperous industry.

Figure 26–6*a* and *b* shows this analysis graphically. The individual supply curves of each of the 1,000 identical firms—one of which is shown as *ss* in Figure 26–6*a*—are summed horizontally to get the total-supply curve *SS* of Figure 26–6*b*. Given total demand *DD*, equilibrium price is found to be $111, and equilibrium quantity for the industry is 8,000 units. This equilibrium price is given and unalterable to the individual firm; that is, the typical firm's demand curve is perfectly elastic at the equilibrium price as indicated by *dd*. Because price is given and constant to the individual firm, the marginal-revenue curve coincides with the demand curve. Price obviously exceeds average total cost at the firm's equilibrium MR (P) = MC output, resulting in a situ-

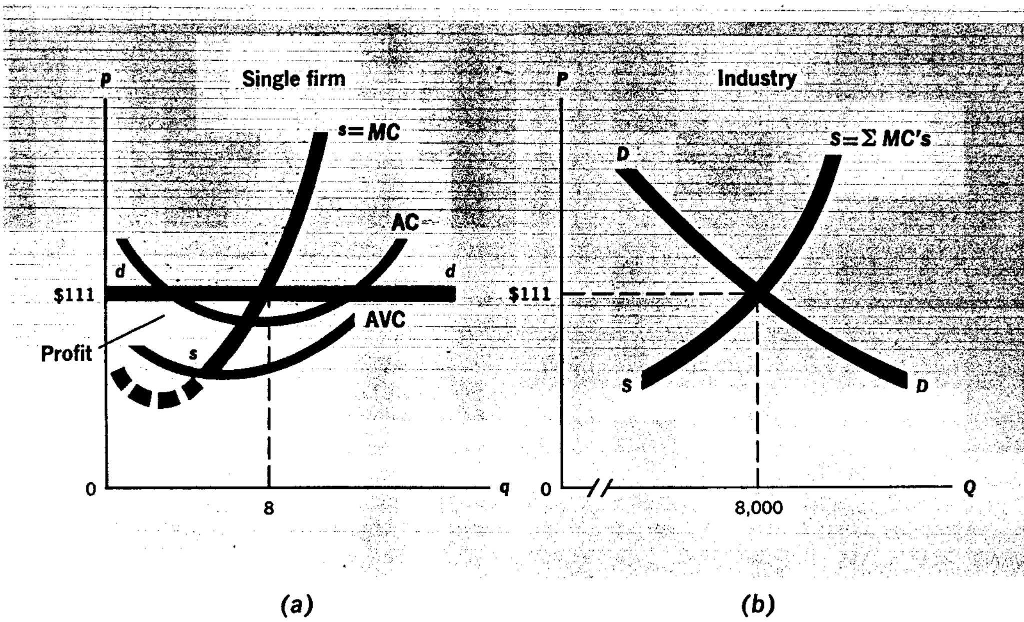


FIGURE 26–6. SHORT-RUN COMPETITIVE EQUILIBRIUM FOR A REPRESENTATIVE FIRM (*a*) AND THE INDUSTRY (*b*). The horizontal sum of the 1,000 firms' supply curves (*ss*) determines the industry supply curve (*SS*). Given industry demand (*DD*), the short-run equilibrium price and output for the industry are $111 and 8,000 units. Taking the equilibrium price as given datum, the representative firm establishes its profit-maximizing output at 8 units and, in this case, realizes the economic profit shown by the white area.

ation of economic profits similar to that already portrayed in Figure 26–2.

Assuming that no changes in costs or market demand occur, these diagrams reveal a genuine short-run equilibrium situation. There are no shortages or surpluses in the market to cause price or total quantity to change. Nor can any of the firms making up the industry improve themselves profitwise by altering their output. Note, too, that higher unit and marginal costs, on the one hand, or a weaker market demand situation, on the other, could have posed a loss situation similar to Figure 26–3. The student is urged to sketch in Figure 26–6*a* and *b* how higher costs and a less favorable demand could cause a short-run equilibrium situation entailing losses.

Figure 26–6*a* and *b* brings out a final notable point. We have emphasized that product price is a given datum to the *individual* competitive firm. But at the same time the supply plans of all competitive producers *as a group* are a basic determinant of product price. If we recall the fallacy of composition, we find there is no inconsistency here. Though each firm, supplying a negligible fraction of total supply, cannot affect price, the sum of the supply curves of all the many firms in the industry constitutes the industry supply curve, and this curve does have an important bearing upon price. In short, under competition, equilibrium price is a given datum to the individual firm and simultaneously is the result of the production (supply) decisions of all firms taken as a group.

PROFIT MAXIMIZATION IN THE LONG RUN

The long run permits firms to make certain adjustments which time does not allow in the short run. In the short run there is a given number of firms in an industry, each of which has a fixed, unalterable plant. True, firms may close down in the sense that they produce zero units of output in the short run; but they do not have sufficient time to liquidate their assets and go out of business. By contrast, in the long run firms already in an industry have sufficient time either to expand or to contract their plant capacities, and, more importantly, the number of firms in the industry may either increase or decrease as new firms enter or old firms leave. We want to discover how these long-run adjustments modify our conclusions concerning short-run output and price determination.

It will facilitate our analysis greatly to make certain simplifying assumptions, none of which will impair the general validity of our conclusions.

1. We shall suppose that the only long-run adjustment is the entry and exodus of firms. Furthermore, for simplicity's sake we ignore the short-run adjustment already analyzed, in order to grasp more clearly the nature of long-run competitive adjustments.

2. It will also be assumed that all firms in the industry have identical cost curves. This allows us to talk in terms of an "average," or "representative," firm with the knowledge that all other firms in the industry are similarly affected by any long-run adjustments which occur.

3. We assume for the moment that the industry under discussion is a constant-cost industry. This means simply that the entry and exodus of firms will not affect resource prices or, therefore, the locations of the unit-cost schedules of the individual firms.

Now the job is to describe long-run competitive adjustments both verbally and through simple graphic analysis. It will be well to state in advance the basic conclusion we seek to explain: *After all long-run adjustments are completed, that is, when long-run equilibrium is achieved, product price will be exactly equal to, and production will occur at, each firm's point of minimum average total cost.* This conclusion follows from two basic facts: (1) firms seek profits and shun losses, and (2) under competition firms are free to enter and leave industries. If price exceeds average total costs, the resulting economic profits will attract new firms to the industry. But this expansion of the industry will increase product supply until price is brought back down into equality with average total cost. Conversely, if price is less than average total cost, the resulting losses will cause firms to leave the industry. As they leave, total product supply will decline, bringing price back up into equality with average total cost.

Our conclusion can best be demonstrated and its significance evaluated by assuming that the average or representative firm in a purely competitive industry is initially in long-run equilibrium. This is shown in Figure 26–7*a*, where price and minimum average total cost are equal at \$50. Economic profits here are zero; hence, the industry is in equilibrium or "at rest," because there is no tendency for firms to enter or leave the industry. As we know, the going market price is determined by total, or industry, demand and supply, as shown by D_1D_1 and S_1S_1 in Figure 26–7*b*. (The market supply schedule, incidentally, is a short-run schedule; the industry's long-run supply schedule will be developed in our discussion.) By examining the quantity axes of the two graphs, we note that if all firms are identical, there must be 1,000 firms in the industry, each producing 100 units, to achieve the industry's equilibrium output of 100,000 units.

Entry of Firms Eliminates Profits

Now our model is set up. Let us upset the serenity of this long-run equilibrium situation and trace the subsequent adjustments.

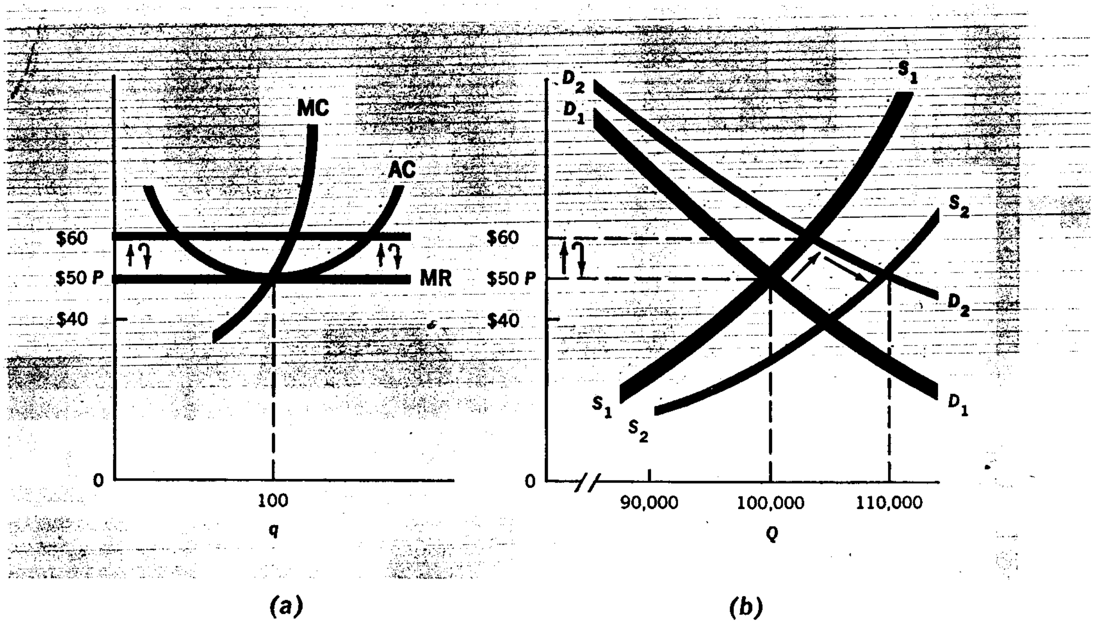


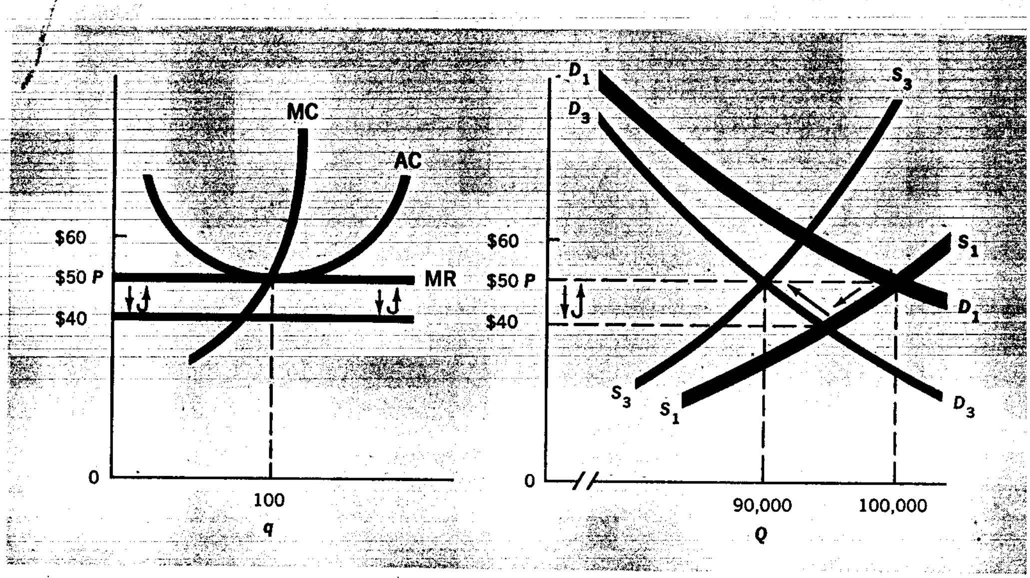
FIGURE 26–7. TEMPORARY PROFITS AND THE REESTABLISHMENT OF LONG-RUN EQUILIBRIUM IN A REPRESENTATIVE FIRM (*a*) AND THE INDUSTRY (*b*). A favorable shift in demand (D_1D_1 to D_2D_2) will upset the original equilibrium and cause economic profits. But profits will cause new firms to enter the industry, increasing supply (S_1S_1 to S_2S_2) and lowering product price until economic profits are once again zero.

Suppose that a change in consumer tastes increases product demand from D_1D_1 to D_2D_2. This favorable shift in demand obviously makes production profitable; the new price of $60 exceeds average total cost. *These economic profits will lure new firms into the industry.* Some of the entrants will be newly created firms; others will shift from less prosperous industries. But as the firms enter, the market supply of the product will increase, causing product price to gravitate downward from $60 toward the original $50 level. Assuming, as we are, that the entry of new firms has no effect upon costs, economic profits will persist, and entry will therefore continue until short-run market supply has increased to S_2S_2. At this point price is again equal to minimum average total cost at $50. The economic profits caused by the boost in demand have been competed away to zero, and as a result the previous incentive for more firms to enter the industry has disappeared. Long-run equilibrium has been restored at this point.

Figure 26–7 tells us that upon the reestablishment of long-run equilibrium, industry output is 110,000 units and that each firm in the now expanded industry is producing 100 units. We can therefore conclude that the industry is now composed of 1,100 firms; that is, 100 new firms have entered the industry.

Exodus of Firms Eliminates Losses

To strengthen our understanding of long-run competitive equilibrium, let us throw our analysis into reverse. In Figure 26–8*a* and *b* the heavy lines show once again the initial long-run equilibrium situation used



(a) (b)

FIGURE 26–8. TEMPORARY LOSSES AND THE REESTABLISHMENT OF LONG-RUN EQUILIBRIUM IN A REPRESENTATIVE FIRM (*a*) AND THE INDUSTRY (*b*).
An unfavorable shift in demand (D_1D_1 to D_3D_3) will upset the original equilibrium and cause losses. But losses will cause firms to leave the industry, decreasing supply (S_1S_1 to S_3S_3) and increasing product price until all losses have disappeared.

as a point of departure in our previous analysis of how the entry of firms eliminates profits.

Now let us suppose that consumer demand falls from D_1D_1 to D_3D_3. This forces price down to $40, making production unprofitable. In time these losses will force firms to leave the industry. As capital equipment wears out and contractual obligations expire, some firms will simply toss in the sponge. As this exodus of firms proceeds, however, industry supply will decrease, moving from S_1S_1 toward S_3S_3. And as this occurs, price will begin to rise from $40 back toward $50. Assuming costs are unchanged by the exodus of firms, losses will force firms to leave the industry until supply has declined to S_3S_3, at which point price is again exactly $50, barely consistent with minimum average total cost. The exodus of firms continues until losses are eliminated and long-run equilibrium is again restored.

The reader will note from Figure 26–8*a* and *b* that total quantity supplied is now 90,000 units and each firm is producing 100 units. This obviously means that the industry is now populated by only 900 firms rather than the original 1,000. Losses have forced 100 firms out of business.

Our prestated conclusion has now been verified. Competition, as reflected in the entry and exodus of firms, forces price into equality with the minimum long-run average total cost of production, and each firm produces at the point of minimum long-run average total cost.

Long-run Supply for a Constant-cost Industry

Even though our discussion is concerned with the long-run, we have noted that the market supply curves of Figures 26–7*b* and 26–8*b* are short-run curves. However, our analysis itself permits us to sketch the nature of the long-run supply curve for this competitive industry. The crucial factor in determining the shape of the industry's long-run supply curve is the effect, if any, which changes in the number of firms in the industry will have upon the costs of the individual firms which the industry comprises.

In the foregoing analysis of long-run competitive equilibrium we assumed the industry under discussion was a *constant-cost industry*. By definition, this means that the expansion of the industry through the entry of new firms will have no effect upon resource prices or, therefore, upon production costs. Graphically, the entry of new firms does not change the position of the long-run average-cost curves of the individual firms in the industry. When will this be the case? For the most part when the industry's demand for resources is small in relation to the total demand for those resources. And this is most likely to be the situation when the industry is employing unspecialized resources which are being demanded by many other industries. In short, when the particular industry's demand for resources is a negligible component of the total demand, the industry can expand without significantly affecting resource prices and costs.

What will be the nature of the long-run supply curve for a constant-cost industry? The answer is contained in our previous discussion of the long-run adjustments toward equilibrium which profits or losses will initiate. Here we assumed that the entry or exodus of firms would not affect costs. The result was that the entry or exodus of firms would alter industry output but always bring product price back to the original $50 level, where it is just consistent with the unchanging minimum average total cost of production. Specifically, we discovered that the industry would supply 90,000, 100,000, or 110,000 units of output, all at a price of $50 per unit. In technical terms the long-run supply curve of a constant-cost industry is perfectly elastic.

This is demonstrated graphically in Figure 26–9. Suppose that product demand for the industry is originally at D_1D_1, industry output is Q_1, and product price is Q_1P_1. This situation, let us suppose, is one of long-run equilibrium. Now assume that demand increases to D_2D_2, upsetting this equilibrium. The resulting economic profits will attract new firms. Because this is a constant-cost industry, entry will continue and industry output will expand until price is driven back down to the unchanged minimum average-total-cost level. This will be at price Q_2P_2 and output Q_2. The long-run industry supply curve *SS*, which connects these equilibrium points, is obviously perfectly elastic.

Long-run Supply for an Increasing-cost Industry

But constant-cost industries are a special case. In most instances the entry of new firms will affect resource prices and therefore unit costs for the individual firms in the industry. When an industry is using a relatively large portion of some resource whose total supply is not readily increased, the entry of new firms will increase resource demand in relation to supply and boost resource prices. This is particularly so in industries which are using highly specialized resources whose initial supply is not readily augmented. The result of higher resource prices will be higher long-run average costs for firms in the industry. These higher costs, it should be noted, take the form of an upward shift in the long-run average-cost curve for the representative firm.

The net result is that when an increase in product demand causes economic profits and attracts new firms to the industry, a two-way squeeze on profits will occur to eliminate those profits. On the one hand, the entry of new firms will increase market supply and lower product price, and, on the other, the entire average-total-cost curve of the representative firm will shift upward. This means that the equilibrium price will now be higher than it was originally. The industry will only produce a larger output at a higher price. Why? Because expansion of the industry has increased average total costs, and in the long

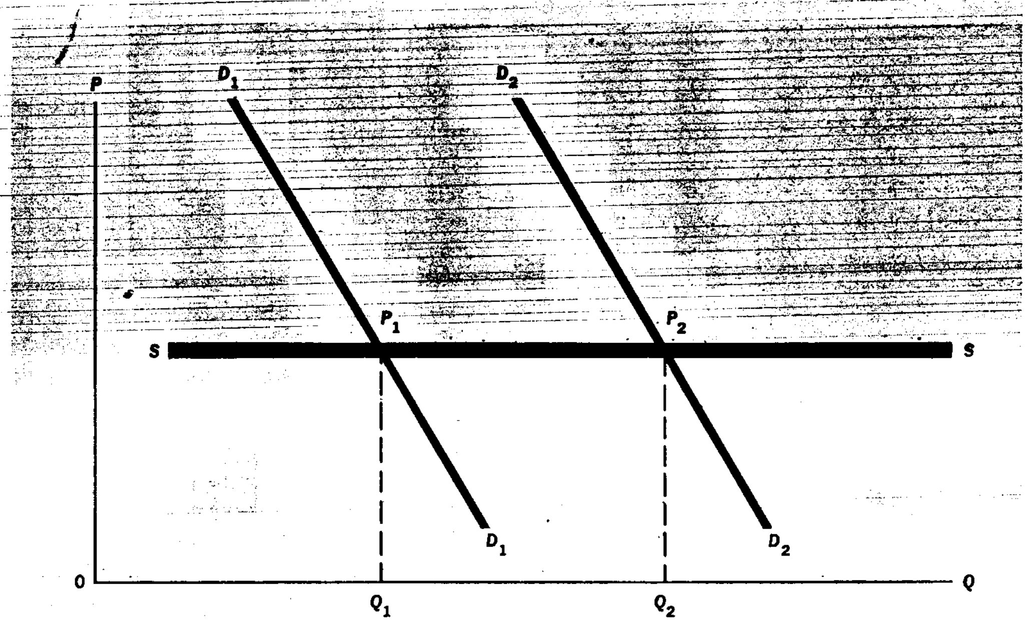


FIGURE 26-9. THE LONG-RUN SUPPLY CURVE FOR A CONSTANT-COST INDUSTRY IS PERFECTLY ELASTIC.

Because the entry of new firms does not affect resource prices or, therefore, unit costs, an increase in demand (D_1D_1 to D_2D_2) will cause an expansion in industry output (Q_1 to Q_2) but no alteration in price ($Q_1P_1 = Q_2P_2$). This means that the long-run industry supply curve (SS) will be perfectly elastic.

run product price must cover these costs. A greater industry output will be forthcoming at a higher price, or, more technically, the industry supply curve for an increasing-cost industry will be upsloping. Instead of getting either 90,000, 100,000, or 110,000 units at the same price of \$50, in an increasing-cost industry 90,000 units might be forthcoming at \$50; 100,000 at \$55; and 110,000 at \$60. The higher price is required to induce more production because costs increase as the industry expands.

This can be seen graphically in Figure 26-10. Original market demand, industry output, and price are D_1D_1, Q_1 and Q_1P_1, respectively. An increase in demand to D_2D_2 will upset this equilibrium and give rise to economic profits. As new firms enter, (1) industry supply will increase, driving price down, and (2) resource prices will rise, causing the average total costs of production to rise. Because of these average-total-cost increases, the new long-run equilibrium price will be established at some level above the original price, such as Q_2P_2.

Which situation—constant or increasing costs—is characteristic of American industry? It is hard to say. Agriculture and extractive industries such as mining and lumbering are increasing-cost industries, because each utilizes a very large portion of some basic resource—farmland, mineral deposits, and timberland. Expansion will significantly affect the demand for these resources and result in higher costs. It is almost impossible to generalize with respect to manufacturing

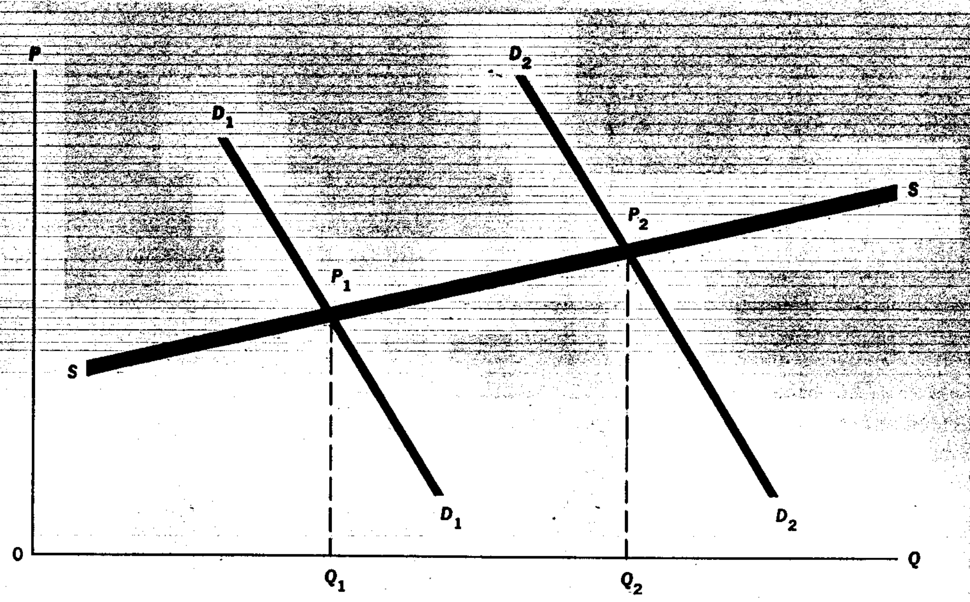


FIGURE 26–10. THE LONG-RUN SUPPLY CURVE FOR AN INCREASING-COST INDUSTRY IS UPSLOPING.
In an increasing-cost industry the entry of new firms in response to an increase in demand (D_1D_1 to D_2D_2) will bid up resource prices and thereby increase unit costs. As a result, an increased industry output (Q_1 to Q_2) will be forthcoming only at a higher price (Q_2P_2 is greater than Q_1P_1). The long-run industry supply curve (*SS*) is, therefore, upsloping.

industries. In their early stages of development such industries may well be relatively constant-cost industries.[2] But as continued expansion increases the importance of these industries in resource markets, they may in time become increasing-cost industries.

[2] Under certain very special circumstances an industry may be for a time a *decreasing-cost industry*. For example, as more mines are established in a given locality, each firm's costs in pumping out water seepage may decline. With more mines pumping, the seepage into each is less, and pumping costs are therefore reduced. Furthermore, with only a few mines in an area, industry output might be so small that only relatively primitive and therefore costly transportation facilities are available. But as the number of firms and industry output expand, a railroad might build a spur into the area and thereby significantly reduce transportation costs. Under such special conditions we get a long-run supply curve which is *down*sloping.

AN EVALUATION OF COMPETITIVE PRICING

Whether a purely competitive industry is one of constant or increasing costs, the final long-run equilibrium position for each firm will have the same basic characteristics. As in Figure 26–11, price (and marginal revenue) will settle at the level where it is equal to minimum average cost. However, we discovered in Chapter 25 that the marginal-cost curve intersects, and is therefore equal to, average cost at the point of minimum average cost. In the long-run equilibrium position

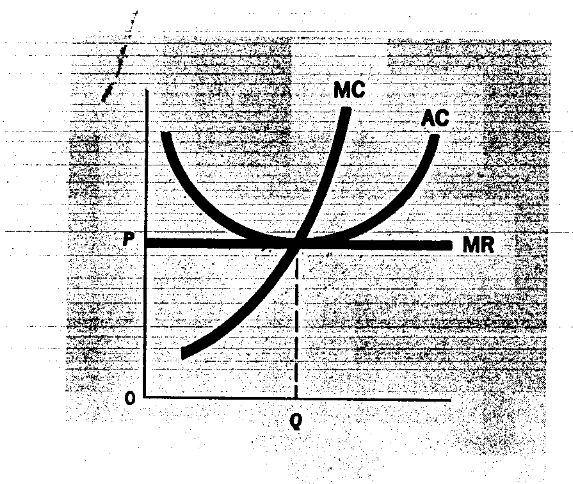


FIGURE 26–11. FOR THE COMPETITIVE FIRM IN LONG-RUN EQUILIBRIUM, P = AC = MC.
The equality of price and minimum average cost indicates that the firm is using the most efficient known technology and is charging the lowest price P and producing the greatest output Q consistent with its costs. The equality of price and marginal cost indicates that resources are being allocated in accordance with consumer preferences.

"everything is equal." MR (P) = AC = MC. This triple equality is of more than geometric interest. It tells us that, although a competitive firm may realize economic profits or losses in the short run, it will barely break even by producing in accordance with the MR (P) = MC rule in the long run. Furthermore, this triple equality suggests certain conclusions concerning the efficiency of a purely competitive economy which are of great social significance. It is to an evaluation of competitive pricing from society's point of view that we now turn.

You will recall that the overview of the price system found in Chapter 5 yielded some general conclusions with respect to the efficiency of any economy characterized by a competitive price system. Equipped now with a better understanding of costs and of price-output determination under competition, we are in a position to sharpen our understanding of the efficiency of a competitive price economy. Specifically, we want to see how our analysis of long-run competitive equilibrium implies certain highly desirable features of a competitive price system.

Efficient Allocation of Resources

Most economists argue that, subject to certain limitations and exceptions, a purely competitive economy will lead to the most efficient, or "ideal," allocation of resources. That is, *a competitive price economy will tend to allocate the fixed supplies of resources available to society in such a way as to maximize the satisfactions of consumers.* Actually, there are two related points which underlie this conclusion. First, it is argued that under pure competition firms will be forced to produce those goods which consumers want the most. Second, competition forces firms to use the most efficient methods in the production of these goods. To facilitate our discussion we shall examine the second point first.

1. P = AC. We have just noted that in the long run competition forces firms to produce at the point of minimum average total cost of production and to charge that price which is just consistent with these costs. This is obviously a most desirable situation from the consumer's point of view. It means that firms must use the best available (least-cost) technology or they will simply not survive. And, too, it means that consumers benefit from the highest volume of production and the lowest product price which are possible under the cost conditions which currently prevail. Furthermore, the costs involved in each instance are only those costs essential in producing a product. Because products are standardized in competitive industries, there will be no selling or promotional costs which must be added to production costs in determining product price.

2. P = MC. But the competitive production of *any* collection of goods does not necessarily make for an efficient allocation of resources. Production must not only be technologically efficient, but it must also entail the "right goods," that is, the goods that consumers want the most. The competitive price system will see to it that resources are allocated so as to result in a total output whose composition best fits the preferences of consumers.

Let us see precisely how this comes about. We must first grasp the social meaning of competitive product and resource prices. The money price of any product—product X—is society's measure, or index, of the relative worth of that product at the margin. Similarly, the marginal cost of producing X measures the value, or relative worth, of the other goods that the resources used in the production of an extra unit of X could otherwise have produced. In short, product price measures the benefit, or satisfaction, which society gets from additional units of X, and the marginal cost of an additional unit of X measures the sacrifice, or cost to society, of other goods in using resources to produce more of X. Now, under competition the production of each product will occur up to that precise point at which price is equal to marginal cost (Figure 26–11). The profit-seeking competitor will only realize the maximum possible profit by equating price and marginal cost. To produce short of the MR (P) = MC point will mean less than maximum profits to the individual firm and an *under*allocation of resources to this product from society's standpoint. The fact that price exceeds marginal cost indicates that society values additional units of X more highly than the alternative products which the appropriate resources could otherwise produce.

For similar reasons, the production of X should not go beyond the output at which price equals marginal cost. To do so would entail less than maximum profits for producers and an *over*allocation of resources to X from the standpoint of society. To produce X at some point at which marginal cost exceeds price means that resources are being used in the production of X at the sacrifice of alternative goods which society values more highly than the added units of X. In brief, *under pure competition producers will be forced to produce each commodity up to that precise point at which price and marginal cost are equated. This means that resources are efficiently allocated under competition.* Each good is produced to the point at which the value of the last unit is equal to the value of the alternative goods sacrificed by its production. To alter the production of X would necessarily reduce consumer satisfactions. To produce X beyond the $P =$ MC point would result in the sacrifice of alternative goods whose value to society exceeds that of the extra units of X. To produce X short of the $P =$ MC point would involve the sacrifice of units of X which society values more than the alternative goods resources can produce.

A further attribute of the competitive price system is its ability to negotiate appropriate adjustments in resource use as changes occur in basic data of the economy. In a competitive economy any changes in consumer tastes, resource supplies, or technology will automatically set in motion appropriate realignments of resources. For example, an increase in consumer demand for product X will increase its price. Disequilibrium will occur, in that at its present output the price of X will now exceed its marginal cost. This will create economic profits in industry X and stimulate its expansion. Its profitability will permit the industry to bid resources away from less pressing uses. Expansion in this industry will end only when the price of X is again equal to its marginal cost, that is, when the value of the last unit produced is once again equal to the value of the alternative goods society forgoes in getting that last unit of X produced. Similarly, changes in the supplies of particular resources or in the techniques pertinent to various industries will upset existing price–marginal-cost equalities by either raising or lowering marginal cost. These inequalities will cause businessmen in either pursuing profits or shunning losses to reallocate resources until price once again equals marginal cost in each line of production. In so doing, they correct any inefficiencies in the allocation of resources which changing economic data may temporarily impose upon the economy.

A final appealing feature of a purely competitive economy is that the highly efficient allocation of resources which it fosters comes about because businesses and resource suppliers freely seek to further their own self-interests. That is, the "invisible hand" (Chapter 5) is at work in a competitive market system. In a competitive economy, businessmen employ resources until the extra, or marginal, costs of production equal the price of the product. This not only maximizes the profits of the individual producers but simultaneously results in a pattern of resource allocation which maximizes the satisfactions of consumers. The competitive price system organizes the private interests of producers along lines which are fully in accord with the interests of society as a whole.

Shortcomings of Competitive Price System

Despite these several virtues, economists acknowledge certain limitations of the price system which may impair its ability to allocate resources efficiently. Some of these criticisms have been previously noted in Chapter 5.

1. The competitive price system does not accurately reflect the needs of consumers. There are two major facets of this criticism. On the one hand, the price system registers and responds only to those wants which can be expressed by individuals in the market. The competitive price system therefore ignores certain important social goods and services—for example, education, highways, and national defense—which consumers need and want. On the other hand, it is also argued that the market demand for various goods does not reflect the needs of consumers very accurately, because income is unequally distributed in a competitive price economy. This uneven distribution of "dollar votes" will lead to the production of trifles for the rich and deny the most basic needs of the very poor. The price system adjusts resources in accordance with a given unequal distribution of income. Some economists argue that the needs of society might be better served by altering the distribution of income which pure competition provides. More will be said on this point in a later chapter.

2. The competitive price system does not accurately measure costs and revenues where social costs and social revenues are significant. Competition forces each producer to assume only those costs which he must pay. This correctly implies that in some lines of production there are significant costs which producers can and do avoid. These avoided costs accrue to society and are aptly called *social costs.* Firms may avoid the cost of properly disposing of waste materials or of buying smoke- and dust-abatement equipment. The result is significant social costs in the form of polluted rivers, smog, and a generally debased community. Similarly, unbridled competition may cause profit-seeking firms to exploit brutally farmland, timberland, and mineral deposits through the use of the cheapest production methods. The cost to society is the permanent loss of irreproducible natural resources. On the other hand, you will recall from Chapter 6 that the consumption of certain goods and services such as chest X rays and polio shots yields widespread satisfactions, or "revenues," to society as a whole. These satisfactions are called *social revenues.*

Now the significance of social costs and social revenues for present purposes is this: The profit-seeking activities of producers will bring about an allocation of resources which is efficient from society's point of view only if marginal cost embodies *all* the costs which production entails and product price accurately reflects *all* the benefits which society gets from a good's production. Only in this case will competitive production at the MR (P) = MC point balance the total sacrifices and satisfactions of society and result in an efficient allocation of resources. To the extent that price and marginal cost are not accurate indexes of sacrifices and satisfactions, that is, to the extent that social costs and revenues exist, production at the

MR (P) = MC point will not signify an efficient allocation of resources.

3. The competitive price system may not always entail the use of the most efficient productive techniques or the development of improved techniques. There are both a static or "right now" aspect and a dynamic or "over time" aspect of this general criticism. The static aspect argues that in certain lines of production existing technology may be such that a firm must be a large-scale producer in order to realize the lowest unit costs of production. Given consumer demand, this suggests that a relatively small number of efficient, large-scale producers is needed if production is to be carried on efficiently. In other words existing mass production economies might be lost if such an industry were populated by the large number of small-scale producers which pure competition requires. This point was discussed in some detail in Chapter 25.

The dynamic aspect of this criticism concerns the willingness and ability of purely competitive firms to undertake technological advance. The progressiveness of pure competition is debated by economists. For present purposes we simply call attention to the fact that some authorities feel that a purely competitive economy would not foster a very rapid rate of technological progress. They argue, first, that the incentive for technological advance may be weak under pure competition, because the profit rewards accruing to an innovating firm as the result of a cost-reducing technological improvement will be quickly competed away by rival firms who readily adopt the new technique. Second, the small size of the typical competitive firm raises serious questions as to whether or not such producers could finance substantial programs of organized research.

4. The competitive price system may not provide for a sufficient range of consumer choice or for the development of new products. This criticism, like the previous one, has both a static and a dynamic aspect. Pure competition, it is contended, entails product standardization, whereas other market structures—for example, monopolistic competition and, frequently, oligopoly—entail a wide range of types, styles, and quality gradations of any product. This product differentiation widens the consumer's range of free choice and simultaneously allows his preferences to be more completely fulfilled. Similarly, critics of pure competition point out that, just as pure competition is not likely to be progressive with respect to the development of new productive techniques, neither is this market structure conducive to the improvement of existing products or the creation of completely new ones.

The question of the progressiveness of the various market structures in terms of both productive techniques and product development will be a recurring one in the following three chapters.

SUMMARY

1. A purely competitive industry comprises a large number of independent firms producing a standardized product. Pure competition assumes that firms and resources are mobile as between different industries. No single firm can influence market price in a competitive industry; price, therefore, equals marginal revenue.

2. Short-run profit maximization by a competitive firm can be analyzed by a comparison of total revenue and total cost or through marginal analysis. A firm will maximize profits by producing that output at which total revenue exceeds total cost by the greatest amount. Losses will be minimized by producing where the excess of total cost over total revenue is at a minimum and less than total fixed costs.

3. Provided price exceeds minimum average variable cost, a competitive firm will maximize profits or minimize losses by producing at that output at which price or marginal revenue is equal to marginal cost. If price is less than average variable cost, the firm will minimize its losses by closing down. If price is greater than average variable cost but less than average total cost, the firm will minimize its losses by producing the $P = \text{MC}$ output. If price exceeds average total cost, the $P = \text{MC}$ output will provide maximum economic profits for the firm.

4. Applying the $\text{MR}(P) = \text{MC}$ rule at various possible market prices leads to the conclusion that the segment of the firm's short-run marginal cost curve which lies above average variable cost is its short-run supply curve.

5. In the long run, competitive price will tend to equal the minimum average cost of production. This is so because economic profits will cause firms to enter a competitive industry until those profits have been competed away. Conversely, losses will force the exodus of firms from the industry until product price once again barely covers unit costs.

6. The long-run supply curve of a constant-cost industry is perfectly elastic. However, for an increasing-cost industry the long-run supply curve is upsloping.

7. In a purely competitive economy the profit-seeking activities of producers will result in an allocation of resources which maximizes the satisfactions of consumers. The long-run equality of price and minimum average cost indicates that competitive firms will use the most efficient known technology and charge the lowest price consistent with their production costs. The equality of price and marginal cost indicates that resources will be allocated in accordance with consumer tastes. The competitive price system will reallocate resources in response to a change in consumer tastes, technology, or resource supplies so as to maintain allocative efficiency over time.

8. Economists recognize four possible deterrents to allocative efficiency in a competitive economy. **a.** Income inequality and the unresponsiveness of the price system to social wants suggest that the competitive price economy does not accurately reflect the needs of consumers. **b.** In allocating resources, the price system does not allow for social costs and revenues. **c.** A purely competitive industry may preclude the use of the best known productive techniques and foster a slow rate of technological advance. **d.** A competitive system provides neither a wide range of product choice nor an environment conducive to the development of new products.